CLAIMS

1. A photochemically refractive-index-changing polymer wherein the polymer is a polymer of one or more monomers comprising an acrylic vinyl monomer represented by the following formula (1):

$$CH_2=C(R^1)C(=O)O-R^2=CH_2 \qquad (1)$$

(wherein R^1 is a hydrogen atom or a methyl group and R^2 is a saturated or unsaturated hydrocarbon group having 1-20 carbon atoms, provided that the monomer may have one or more heteroatoms and one or more halogen atoms in the molecule) as an essential component, and

wherein the polymer has a radial-polymerizable side-chain vinyl group remaining in the molecule and, upon irradiation with a radiation, undergoes a refractive-index increase (Δn) through the irradiation of 0.005 or more (as measured by the m-Line method in the TE mode).

2. The photochemically refractive-index-changing polymer according to claim 1, wherein 90% or more of the radical-polymerizable side-chain vinyl groups remain in the molecule.

3. The photochemically refractive-index-changing polymer according to claim 1 or 2, which is one of (a) a homopolymer of an acrylic vinyl monomer represented by formula (1), (b) a copolymer of two or more acrylic vinyl monomers represented by formula (1), and (c) a copolymer of one or more acrylic vinyl monomers represented by formula (1) and one or more other monomers.

4. The photochemically refractive-index-changing polymer according to any one of claims 1 to 3, which has a stereoregularity of 70% or higher in terms of syndiotacticity (rr).

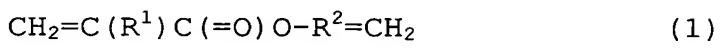
5. The photochemically refractive-index-changing polymer according to any one of claims 1 to 4, wherein the radiation is ultraviolet.

6. The photochemically refractive-index-changing polymer according to claim 5, which upon irradiation with ultraviolet in an irradiation dose of 10 J/cm^2 or less, undergoes a refractive-index increase (Δn) through the irradiation of 0.005 or more (as measured by the m-Line method in the TE mode).

7. A photochemically refractive-index-changing polymer composition, which comprises the photochemically

refractive-index-changing polymer according to any one of claims 1 to 6 and at least one member selected from a photoinitiator, a sensitizer, and a chain transfer agent and, upon irradiation with a radiation, undergoes a refractive-index increase (Δn) through the irradiation of 0.005 or more (as measured by the m-Line method in the TE mode).

8. A photochemically refractive-index-changing polymer composition, wherein the composition comprises a polymer which is a polymer of one or more monomers comprising an acrylic vinyl monomer represented by the following formula (1):



$$CH_2=C(R^1)C(=O)O-R^2=CH_2 \qquad (1)$$

(wherein R^1 is a hydrogen atom or a methyl group and R^2 is a saturated or unsaturated hydrocarbon group having 1-20 carbon atoms, provided that the monomer may have one or more heteroatoms and one or more halogen atoms in the molecule) as an essential ingredient,

wherein the polymer has a radial-polymerizable side-chain vinyl group remaining in the molecule and at least one member selected from a photoinitiator, a sensitizer, and a chain transfer agent, and

wherein upon irradiation with a radiation, the composition undergoes a refractive-index increase (Δn) through

the irradiation of 0.005 or more (as measured by the m-Line method in the TE mode).

9. The photochemically refractive-index-changing polymer composition according to claim 8, wherein the polymer has 90% or more of the radical-polymerizable side-chain vinyl groups remaining in the molecule.

10. The photochemically refractive-index-changing polymer composition according to claim 8 or 9, wherein the polymer is one of (a) a homopolymer of an acrylic vinyl monomer represented by formula (1), (b) a copolymer of two or more acrylic vinyl monomers represented by formula (1), and (c) a copolymer of one or more acrylic vinyl monomers represented by formula (1) and one or more other monomers.

11. The photochemically refractive-index-changing polymer composition according to any one of claims 8 to 10, wherein the polymer has a stereoregularity of 70% or higher in terms of syndiotacticity (rr).

12. The photochemically refractive-index-changing polymer composition according to any one of claims 7 to 11, wherein the radiation is ultraviolet.

13. The photochemically refractive-index-changing polymer composition according to claim 12, which upon irradiation with ultraviolet in an irradiation dose of 10 J/cm^2 or less, undergoes a refractive-index increase (Δn) through the irradiation of 0.005 or more (as measured by the m-Line method in the TE mode).

14. A method of refractive index regulation, wherein the photochemically refractive-index-changing polymer according to any one of claims 1 to 6 or the photochemically refractive-index-changing polymer composition according to any one of claims 7 to 13 is irradiated with a radiation to thereby cause the polymer or composition to undergo a refractive-index increase (Δn) through the irradiation of 0.005 or more (as measured by the m-Line method in the TE mode).

15. The method of refractive index regulation according to claim 14, wherein the radiation is ultraviolet.

16. The method of refractive index regulation according to claim 15, wherein the irradiation dose of ultraviolet is 10 J/cm^2 or less.

17. A process for producing a photochemically refractive-index-changing polymer, characterized by subjecting

one or more monomers comprising an acrylic vinyl monomer represented by the following formula (1):

$$CH_2=C(R^1)C(=O)O-R^2=CH_2 \qquad (1)$$

(wherein R^1 is a hydrogen atom or a methyl group and R^2 is a saturated or unsaturated hydrocarbon group having 1-20 carbon atoms, provided that the monomer may have one or more heteroatoms and one or more halogen atoms in the molecule) as an essential ingredient to anionic polymerization using as a polymerization initiator a metal complex catalyst including a rare earth metal as an active center to thereby obtain the photochemically refractive-index-changing polymer according to any one of claims 1 to 6.

18. The process for producing a photochemically refractive-index-changing polymer according to claim 17, wherein the metal complex catalyst including a rare earth metal as an active center is a metal complex compound represented by the following formula (2):

$$(Cp1)(Cp2)Mr-(R)_p\cdot(L)_q \qquad (2)$$

(wherein Cp1 and Cp2 each independently is an unsubstituted cyclopentadienyl or a substituted

cyclopentadienyl, provided that Cp1 and Cp2 may be bonded to each other directly or through a connecting group; Mr is a rare earth metal atom having a valence of r, provided that r is an integer of 2-4; R is a hydrogen atom or a linear alkyl group having 1-3 carbon atoms; L is a solvent having a coordinating ability; and p is the number of R's and q is the number of L's, p and q each being an integer of 0-2 and selected so as to satisfy the following relationship with the r: r=p+2).